

FURCAL PERFORATION REPAIR: MTA VERSUS CALCIUM HYDROXIDE

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ABSTRACT

Furcal perforation is usually undesirable and unfortunate incident commonly encountered during an endodontic access cavity or exploration of orifices of canal / s. A randomized control trial was conducted on 90 patients with furcal perforation. The objective was to compare effectiveness of Mineral Trioxide Aggregate (MTA) with Calcium Hydroxide in furcal repair in lower molars. radiographic assessment was done at 3 and 6 months interval. the collected data was analyzed using SPSS version 14. 90 patients with furcal perforation divided into group A and group B with 45 patients in each group. Group A was treated with MTA and Group B with Calcium Hydroxide respectively. After 3 & 6 months, a radiographic effectiveness was considered with the resolution of peri-radicular lesion. In group A, 43 patients showed complete recovery (success rate 95.6%). In Group B, 21 patients showed complete recovery (success rate 46.6%). It was concluded, MTA was better material for repair of furcal perforation than Calcium hydroxide.

Key Words: *Furcal Perforation, Mineral Trioxide Aggregate, Calcium Hydroxide, Root Canal Treatment.*

INTRODUCTION

A major complication of endodontic treatment is accidental perforation of roots and/or the pulp chamber which accounts for 9.6% of failed cases.^{1,2,3} Perforation complicates promotion of osseous regeneration through removal of bacteria and seal root canal.¹ Perforation of root may occur during endodontic treatment, retreatment, and post space preparation either iatrogenically or by caries/resorptive process. Causes of perforations are aberrant canal anatomy (extra canal, excessive curvature, calcification), misguided access preparation, overzealous instrumentation.³ The prognosis maybe questionable, if treatment involves furcal region. Furcal perforation has poor prognosis because of close proximity to oral environment which has higher potential to cause periodontal defect.^{2,8} However, prognosis is good if the perforation is diagnosed correctly and treated with material with suitable sealing ability

and biocompatibility.²⁵ Perforation in cervical 1/3rd of root or in the floor of pulp chamber has had poorer prognosis than at apical 1/3rd or middle 1/3rd of root canal. If repaired immediately, there is good prognosis.^{2,4,5} Various materials have been used to treat furcal perforations including zinc oxide eugenol, amalgam, cavit, super EBA, GIC, Ca (OH)₂, IRM, DFDB^{2,3,9} and Ormocer.^{4,5,7} Novel materials in the field are CEM (Calcium enriched mixture) and Biodentine.^{32,33} The ideal material for treating radicular perforations should be nontoxic, nonabsorbable, radiopaque, and bacteriostatic or bactericidal³⁷; it should also provide a seal against microleakage from the perforation.^{26,29,36}

Mineral trioxide aggregate (MTA) is the main perforation repair material which has ideal characteristics like biocompatibility, less susceptibility to inflammation and less solubility in oral fluids. It also has a good capacity to create seal between the pulpal chamber and periodontal tissues.³⁴ Its clinical applications include direct pulpal coverage and radicular resorption.^{27,28,30} Others are; sealing communications between the root canal space and external root surfaces, filling root canals of teeth with mature and open apices as well as management of dens invaginatus.³¹

Calcium hydroxide is also used as repair material for repairing furcal perforations. but it tends to soften, disintegrate over time, leaving voids and other potential pathways for bacterial infiltration.^{10,11,12,35} Both Ca(OH)₂ and MTA has pH= 12.5.

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The aim of this study was to compare the effectiveness of Mineral Trioxide Aggregate and Calcium hydroxide as furcal perforation repair material.

METHODOLOGY

This randomised control trial was conducted on 90 perforation cases visiting Department of Operative Dentistry, de'Montmorency College of Dentistry/Punjab Dental Hospital, Lahore from April 2009 to October 2009. Informed consent for participation in the study was obtained from each patient. After completion of root canal treatment subjects were divided into two groups using random number table. In Group A (n=45) MTA mixed with normal saline was condensed in perforation area with ball-ended instrument and damp cotton pledget was placed over it. In Group B (n=45) furcal perforation was covered with thick paste of Calcium hydroxide mixed with normal saline using ball ended instrument and damp cotton pledget. Post-operative radiograph was taken after placement of both materials. A follow up radiograph was taken after 3 and 6 months duration. Assessment of Repair of furcal perforation was compared.

RESULTS

The collected data was analysed using SPSS version 14. Frequencies and percentages were calculated for qualitative data. Chi-square test was applied to compare the effectiveness of both materials and a p value < 0.05 was considered significant.

90 Teeth were treated in 90 patients {33 were male (36.7%) and 57 were female (63.3%)}. The age of patients ranged between 15 to 40 years. Out of 90

TABLE 1: RESOLUTION OF LESION IN EACH GROUP

Groups of patients	Resolution of Lesion			Total
	No healing	After 3 months	After 6 months	
Group A	2	23	20	45
Group B	24	12	9	45
Total	26	35	29	90

TABLE 2: OVERALL RESOLUTION OF LESION

Groups of patients	No. of patients	Resolution of Lesion	Percentage
Group A	45	43	95.6
Group B	45	21	46.7
Total	90	64	
	Value	df	P value
Pearson Chi-square	26.245	2	.000

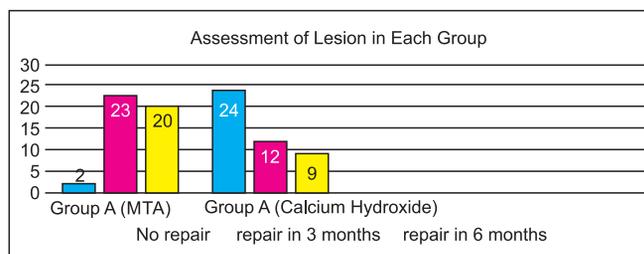


Fig 1: Box Plot representation of a comparison between MTA and Ca(OH) As furcal perforation repair material

patients 26 (28.9%) showed no resolution of lesion, 35 (38.9%) showed resolution of lesion after 3 months while 29 (32.2%) showed resolution of lesion after 6 months {Table 1}.

RADIOGRAPHIC EVALUATION

Radiographic evaluation of teeth in both groups revealed that

In Group A, 2 patients (4.4%) showed no healing, 23 patients (5.11%) showed resolution of lesion after 3 months while 20 patients (44.4%) showed resolution of lesion after 6 months. In Group B, 24 patients (53.3%) showed no resolution of lesion, 12 patients (26.6%) showed resolution of lesion after 3 months and 9 (19.8%) patients showed resolution of lesion after 6 months. {Table 2}

The overall success rate in Group A is 95.6% and in Group B 46.7%. Chi-square analysis for the absence of lesion, between two groups is 26.245 and p value is significant (p < 0.05) {Table 2}

DISCUSSION

In the study by Himel et al. Ca(OH)₂ and tricalcium phosphate were used as furcal repair materials. It was observed that Ca(OH)₂ showed initial toxicity and tissue destruction due to continuing inflammatory response but later showed induction of hard tissue apposition.¹³ Tricalcium phosphate group showed evidence of healing with layers of epithelium, collagen and bone with few inflammatory cells.

Barnante and Berbert in their study used Ca(OH)₂ with iodoform for perforation repair. Despite its rapid absorption, reorganization of periodontal tissue and formation of biological sealing, it also showed that its action diminishes when comes in contact with blood clot. They concluded that Ca(OH)₂ paste with iodoform showed necrosis at the perforation site and different levels of cementum hyperplasia.¹⁴

In a study by Schwartz et al, different case reports showed the same results as that of present study. MTA gave promising results after 6 months follow u. In addition, there were no sign or symptoms of pathology and the radiolucency in the furcation area also resolved.¹⁶

In a study by Holland et al results concluded that

after 30 days of placing MTA in non-contaminated perforation area, there is evidence of deposition of newly formed cementum, thereby leading to formation of biological seal plus after 6 months follow up complete absence of inflammatory cells. In a study by Pitt Ford et al it was observed that non contaminated MTA sealed perforations had better repair than contaminated perforations.¹⁸ This findings is consistent with present study.

In a study by Ghanbari and Ghoddsi, there was significantly less inflammation in groups in which perforations were sealed immediately with MTA. A period of 4 months was considered enough to observe the healing process in the perforation area. Results of present study are similar to this study and 3 and 6 months follow up was used to observe the healing process.¹⁹

In a study by Ashofteh Yazdi et al perforations were repaired with MTA, Glass ionomer and Amalgam. Their results showed that MTA and Glass ionomer showed less inflammation and both are biocompatible. They conclude that application of MTA for repairing perforations was superior to Glass ionomer and Amalgam due to high moisture resistance.²⁰ These results are similar to present study.

The results of present study are similar to Pace study in which sealing of the defect with MTA is done without internal matrix. The clinical and radiographic follow ups were done at 6 months, 1 year, 2 year and 5 year. The results confirmed that MTA without matrix provides an effective seal of root perforations and clinical healing of the surrounding periodontal tissue.²¹

Arens and Torabinejad observed better results when furcal perforations were repaired by using MTA without internal matrix as opposed to MTA with internal matrix. They concluded that MTA does not need a barrier when used to repair large furcal perforation.²²

2 cases studies of perforation with repair using MTA was conducted by Sanchez-Ayala et al 3 and 6 month radiographic follow up provided evidence of bone formation adjacent to the MTA. Although prognosis is typically better for smaller lesions, and although the location of these perforations at the level of epithelial attachment and crestal bone suggested a guarded prognosis, yet MTA treatment was successful.²³ These results are conducive to the present study. The present study is particularly important in that it appears to be the first time that MTA has ever been applied in repairing furcal perforations in patients visiting Punjab Dental Hospital Lahore.

CONCLUSION

It was concluded that when a perforated site is immediately sealed with MTA, the prognosis is promising. Treatment time is also very much reduced in MTA.

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- 3 Sobia Masood:** Library searches, assembling data, review of manuscript.